Connect Tech Inc.
Industrial Strength Communications

Xtreme/PSU-UPS
User Manual

Limited Lifetime Warranty

Connect Tech Inc. provides a lifetime warranty for all of our products. Should this product, in Connect Tech Inc.'s opinion, fail to be in good working order during the warranty period, Connect Tech Inc. will, at its option, repair or replace this product at no charge, provided that the product has not been subjected to abuse, misuse, accident, disaster or non Connect Tech Inc. authorized modification or repair.

You may obtain warranty service by delivering this product to an authorized Connect Tech Inc. business partner or directly to Connect Tech Inc. along with proof of purchase. Product returned to Connect Tech Inc. must be pre-authorized by Connect Tech Inc. with an RMA (Return Material Authorization) number marked on the outside of the package and sent prepaid, insured and packaged for safe shipment. Connect Tech Inc. will return this product by prepaid ground shipment service.

The Connect Tech Inc. lifetime warranty is defined as the serviceable life of the product. This is defined as the period during which all components are available. Should the product prove to be irreparable, Connect Tech Inc. reserves the right to substitute an equivalent product if available or to retract lifetime warranty if no replacement is available.

The above warranty is the only warranty authorized by Connect Tech Inc. Under no circumstances will Connect Tech Inc. be liable in any way for any damages, including any lost profits, lost savings or other incidental or consequential damages arising out of the use of, or inability to use, such product.

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Table of Contents

Revision History

Revision	Date	Author(s)	Change(s)
0.00	05-01-2013	RC	Initial Manual Revision Created
0.01	06-13-2013	RC	Added Thermal, Power Sequencing Data.
0.02	25-07-2013	RC	Added USB software information.

Customer Support Overview

If you experience difficulties after reading the manual and/or using the product, contact the Connect Tech Inc. reseller from which you purchased the product. In most cases the reseller can help you with product installation and difficulties.

In the event that the reseller is unable to resolve your problem, our highly qualified support staff can assist you. Our support section is available 24 hours a day, 7 days a week on our website at: www.connecttech.com/sub/support/support.asp. See the contact information section below for more information on how to contact us directly. Our technical support is always free.

Contact Information

We offer three ways for you to contact us:

Mail/Courier
You may contact us by letter at: Connect Tech Inc.
Technical Support
42 Arrow Road, Guelph, ON
Canada N1K 1S6

Email/Internet
You may contact us through the Internet. Our email and URL addresses on the Internet are:
sales@connecttech.com
support@connecttech.com
www.connecttech.com

Note:
Please go to the **Download Zone** or the **Knowledge Database** in the **Support Center** on the Connect Tech Inc. website for product manuals, installation guides, device driver software and technical tips. Submit your technical support questions to our customer support engineers via the **Support Center** on the Connect Tech Inc. website.

Telephone/Facsimile
Technical Support representatives are ready to answer your call Monday through Friday, from 8:30 a.m. to 5:00 p.m. Eastern Standard Time. Our numbers for calls are:

Telephone: 800-426-8979 (North America only)
Telephone: 519-836-1291 (Live assistance available 8:30 a.m. to 5:00 p.m. EST, Monday to Friday)
Facsimile: 519-836-4878 (online 24 hours)

Introduction

Connect Tech's Xtreme/PSU-UPS is a high efficiency, high powered PC/104 form factor power supply with extended temperature capabilities. Xtreme/PSU-UPS is a highly reliable power supply which provides 154W of total output power with +5V, +3.3V, +12V, -12V and +5V-Standby output voltages. It can be used as a stand-alone power supply to power any other embedded system, or used directly to power any PCI-104 stack or single board computer (SBC). The Xtreme/PSU-UPS has a wide input voltage range that accepts +9V to +36V DC and is specifically designed for use in a broad range of rugged applications including military, industrial, and air and ground vehicles. Xtreme/PSU-UPS can be used in combination with Connect Tech's stackable CPU and expansion boards for a total design solution.

In addition to the power supply capabilities, the Xtreme/PSU-UPS also has the ability to charge, monitor and switch from main supply to a backup SMART battery, providing transparent backup power to all voltage outputs. The Xtreme/PSU-UPS is a Level 2 SMART battery charger and works with all SMART batteries, supporting charge voltages up to +16V and charging current up to 4A.

ESD Warning

Electronic components and circuits are sensitive to ElectroStatic Discharge (ESD). When handling any circuit board assemblies including Connect Tech COM Express carrier assemblies, it is recommended that ESD safety precautions be observed. ESD safe best practices include, but are not limited to:

- Leaving circuit boards in their antistatic packaging until they are ready to be installed.
- Using a grounded wrist strap when handling circuit boards, at a minimum you should touch a grounded metal object to dissipate any static charge that may be present on you.
- Only handling circuit boards in ESD safe areas, which may include ESD floor and table mats, wrist strap stations and ESD safe lab coats.
- Avoiding handling circuit boards in carpeted areas.
- Try to handle the board by the edges, avoiding contact with components.

Detailed Technical Specifications

Specification	Details
Dimensions	• 3.550" x 3.775" (90mm x 96) PC/104 Compliant • Fully meets the PC/104 component height requirements • Download 3D Model Files (Click Here) - .step model files
Input Voltage Range	• +9V to +36V DC • Input Suppression Diode and Series Fuse and Reverse Polarity Input Protection • 15A fused maximum power draw protection
+3.3V Output	• 10A (50W) maximum • 1% Output regulation accuracy • <50mV p-p ripple at full load. • Output Current Limiting Protection • Output Overvoltage Protection • Remote ON/OFF control via SHUTDOWN# switch and RS-232.
+5V Output	• 10A (50W) maximum • 1% Output regulation accuracy • <50mV p-p ripple at full load. • Output Current Limiting Protection • Output Overvoltage Protection • Remote ON/OFF control via SHUTDOWN# switch and RS-232.
+12V Output	• 5A (60W) maximum • 1% Output regulation • <40mV p-p ripple at full load. • Output Current Limiting Protection • Output Overvoltage Protection • Remote ON/OFF control via SHUTDOWN# switch and RS-232.
-12V Output	• 0.5A (6W) maximum • 1% Output regulation accuracy • <40mV p-p ripple at full load. • Current limiting protected • Remote ON/OFF control via SHUTDOWN# switch and RS-232.
+5V Standby Output	• 1A (5W) maximum • 1% Output regulation accuracy • <15mV p-p ripple at full load. • Current limiting protected
Operating Temperature	• -40 to +85 Degrees Celsius • See derating section for full details on current consumption vs. input voltage.
Warranty and Support	• Lifetime Warranty • Free Technical Support

Board Diagram
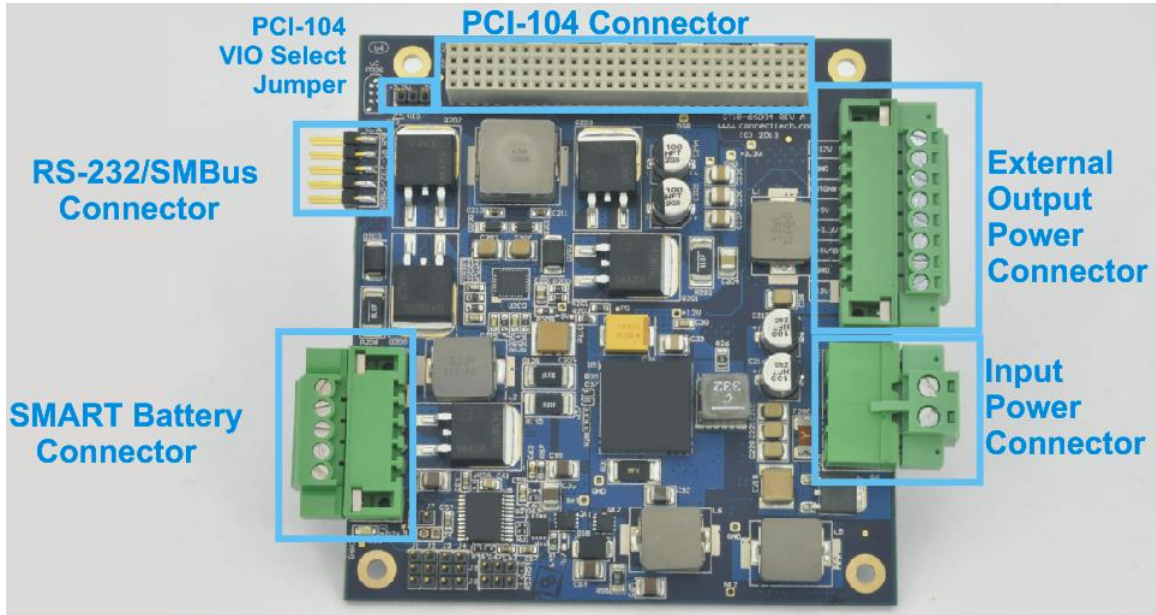
Functional Block Diagram
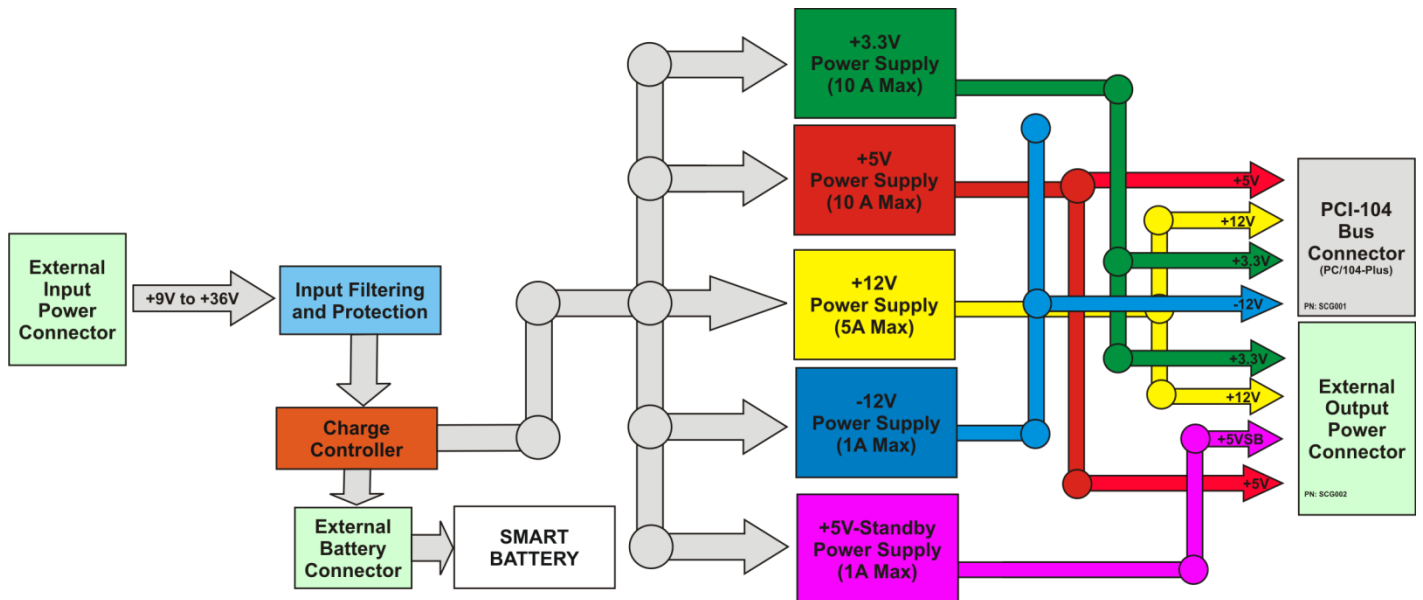
Example Usage Block Diagram
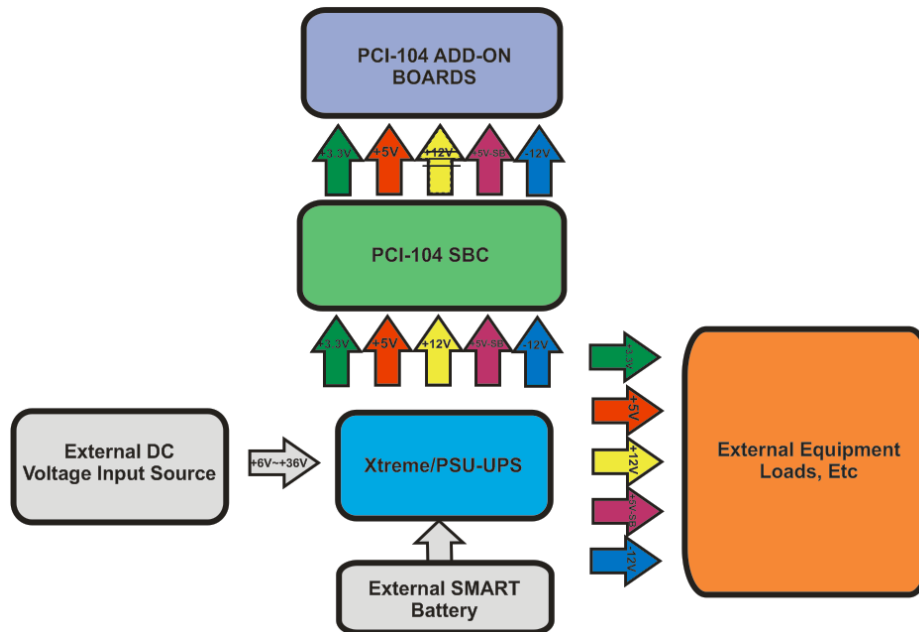
Part Number Information

Part Number	Features	Board Image
SCG001	**PCI-104 Build** - +5V @ 10A, +3.3V @10A,+12V @ 5A, -12V @0.5A, +5VSB @ 1A - +5V, +3.3V**, +12V and -12V connected to PCI-104 Bus connector.	
SCG002	**Embedded Build** - +5V @ 10A, +3.3V @10A,+12V @ 5A, -12V @0.5A, +5VSB @ 1A	
**5V PCI only option available		

Other available ordering options:
- 5V PCI bus voltage only (no 3.3V) available
- Aluminum caps removed/replaced for vacuum application

To order any of these part numbers or to inquire about the other available ordering options please contact sales@connecttech.com for further information.

Hardware Installation

The *Xtreme/PSU-UPS* can be installed into a PC/104 stack to provide power to the stack through its bus connectors or external power connector. The Xtreme/PSU-UPS can also be used as a stand-alone embedded power supply to provide power to any other piece of equipment or embedded SBC.

To install the Xtreme/PSU-UPS in your system please follow these steps:
1. Ensure your DC input power is **OFF** (+9V to +36V)
2. Install standoffs into system
3. Insert Xtreme/PSU-UPS onto stack (bottom, middle or top) connecting its bus connectors to PCI-104.
4. Ensure board is bolted/screwed into stack
5. Connect any external power connections to the Xtreme/PSU-UPS's External Power Connector
6. Connect input power connection to the Xtreme/PSU-UPS' Input Power Connector
    *** WARNING NEVER PLUG IN A LIVE CONNECTION TO THE INPUT POWER ***
7. Power on input power to power up the system.

PCI-104 Stacking Example #1 (Top of Stack)
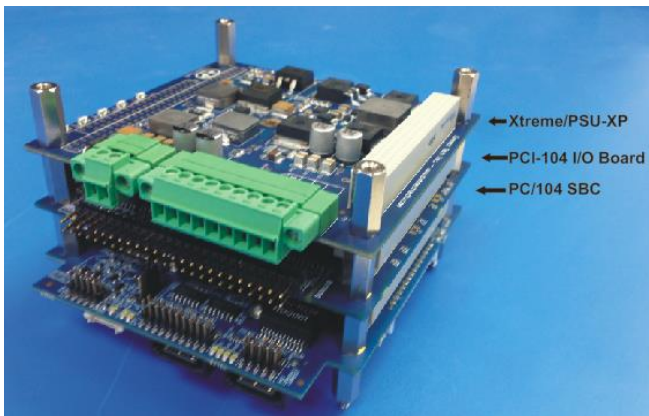
PCI-104 Stacking Example #2 (Bottom of Stack)
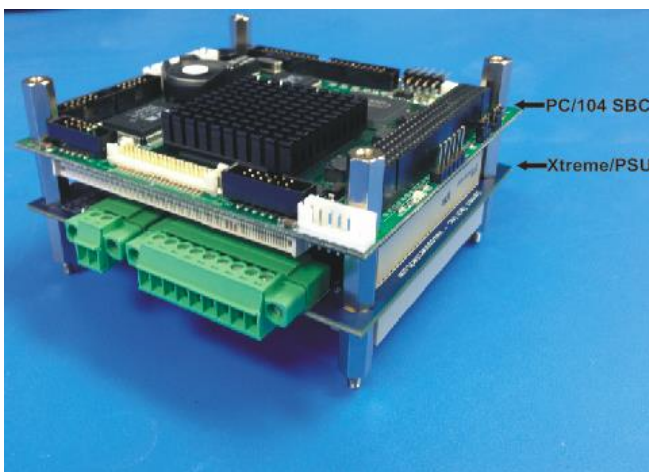
Input Power

The Xtreme/PSU-UPS is meant to use any DC input power source in the range of +9V to +36V DC, which is ideal for many vehicle or mobile application, but also many industrial power solutions as well.

Input Power Circuit Diagram
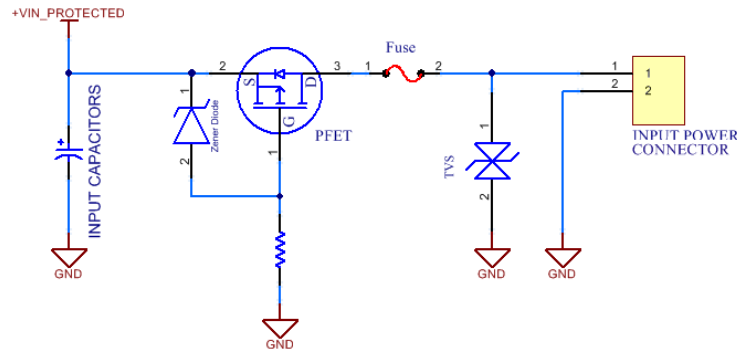
Technical Specifications

- Input Voltage Range: +9V to +36V DC
- Input Fuse Rating: 65V Max, 15A Max
- Input Capacitor Max Voltage: 50V Max

Input Power Connector Pinout

PIN2 -VIN (Negative Terminal)
PIN1 +VIN (Positive Terminal)

The input power connector on the Xtreme/PSU-UPS is a standard 2-pin 3.5mm pitch terminal block w/screw flange connector that mates to a 3.5mm screw terminal plug (with or without flange). With your purchase of the Xtreme/PSU-UPS you will have received a mating plug connector, below is a list of plug part numbers that are compatible with the PSG.

Input Power Connector Plug Compatible Part Numbers
Part Number: 20020002-G031B01LF   Manufacturer: FCI
Part Number: 796858-2   Manufacturer: TE Connectivity
Part Number: 1835478   Manufacturer: Phoenix Contact
Part Number: OSTVM027552   Manufacturer: On Shore Technology Inc

Output Power

The Xtreme/PSU-UPS is meant to use any DC input power source in the rage of +9V to +36V DC, which is not only ideal for many vehicle or mobile applications, but also many industrial power solutions as well.

Technical Specifications

The *Xtreme/PSU-UPS* outputs 5 main voltage rails:
- +3.3V @ up to 10A
- +5V @ up to 10A
- +12V @ up to 5A
- -12V @ up to 0.5A
- +5V-SB @ up to 1A

All outputs provide:
- Current Limiting Protection
- Overvoltage Protection
- Remote ON/OFF control via SHUTDOWN# switch or remote RS-232 connection(+5V standby power is always on and not controlled by SHUTDOWN#)

Output Power Connector Pinout
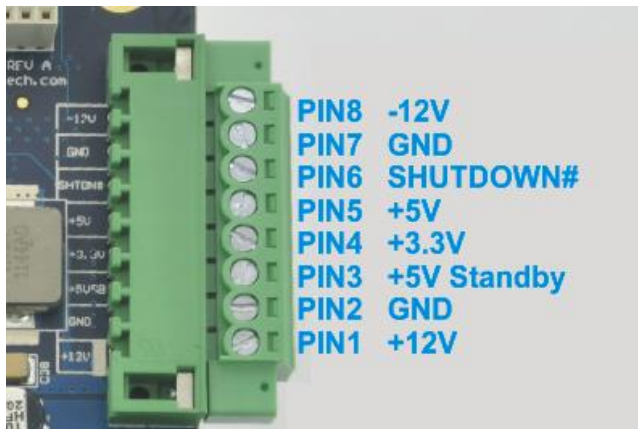
Output Power Connector Plug Compatible Part Numbers
With Screw Flange
Part Number: 284510-8   Manufacturer: TE Connectivity
Part Number: 1606700000   Manufacturer: Weidmuller
Part Number: OSTTJ0811520   Manufacturer: On Shore Technology Inc
Part Number: 39504-0008   Manufacturer: Molex
Part Number: 1863369   Manufacturer: Phoenix

Battery Connector

The Xtreme/PSU-UPS battery connection includes the power and SMbus connections necessary between the supply charger and the SMART battery.

Battery Connector Pinout

PIN1 - TEMPERATURE
PIN2 - SMBUS DATA
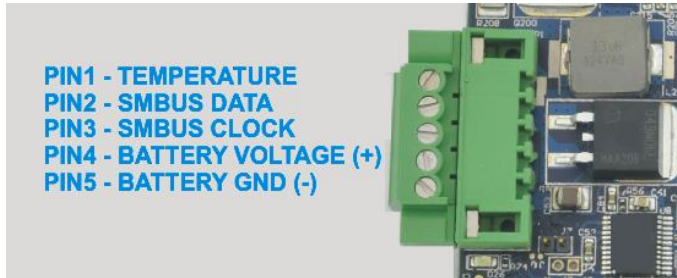PIN3 - SMBUS CLOCK
PIN4 - BATTERY VOLTAGE (+)
PIN5 - BATTERY GND (-)

Output Power Connector Plug Compatible Part Numbers
With Screw Flange

Part Number: 284510-5	Manufacturer: TE Connectivity
Part Number: 1606670000	Manufacturer: Weidmuller
Part Number: OSTTJ0511520	Manufacturer: On Shore Technology Inc
Part Number: 39504-0005	Manufacturer: Molex
Part Number: 1847084	Manufacturer: Phoenix

Battery Support

The Xtreme/PSU-UPS will support any SMART battery using the SMbus SBS 1.1 specification. A few examples of manufacturers providing a range of SMART batteries are below.

Inspired Energy   - http://inspiredenergy.com/Standard_Products/standard_products.htm

Entellion   - http://www.accutronics.co.uk/vr-series-batteries/

To find a custom or off the shelf battery to meet your exact specifications please email support@connect.com and we can find the best solution to fit your needs.

Configuration Jumpers

J1-J4: Data configuration registers

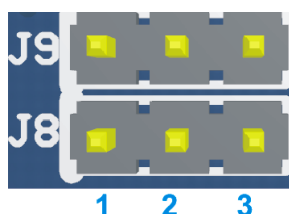|	Description	1-2	2-3
J1	SMBus Voltage (+VSMB)	Voltage sourced from P4 Connector – pin8	SMBus voltage from on-board +3.3V
J2	SMBus ALERT#	Connected to RS-232/USB interface	Connected to SMBus header – P4
J3	SMBus CLK	Connected to RS-232/USB interface	Connected to SMBus header – P4
J4	SMBus DATA	Connected to RS-232/USB interface	Connected to SMBus header – P4

*** WARNING: When sourcing +VSMB from the P4 connector, battery control circuitry is also powered from this source. This voltage must never exceed +5.25V DC. ***

J7: SMBus Pullup Enable Jumper

Install this jumper to pull-up the SMBus Data, Clock and ALERT# lines to +VSMB. The value of +VSMB is determined by the setting of jumper J1 outlined above. In most cases, this jumper must be installed for operation and charging of the smart battery.

J8-J9: Charge configuration registers

	Description	1-2	2-3	Open (No Jumper Installed)
J8	Charge Current Limit	1A Limit	2A Limit	4A Limit
J9	Charge Voltage Limit	8.8V Limit	13V Limit	16V Limit

*** WARNING: Do not change the position of these jumpers during operation or with Input power (Vin or Battery) connected. Failure to do so can damage the board and/or SMART battery. ***

RS-232/SMBus Connector Pinout (P4)

View facing 10 pin header
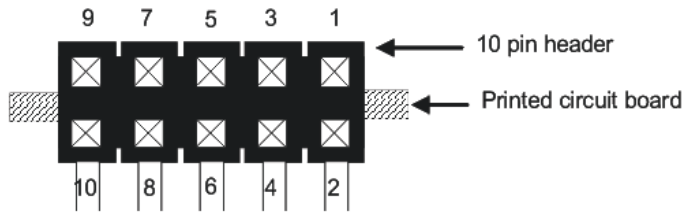
Pin No.	Description	Direction
1	NC	N/A
2	SDA – SmBus Data	I/O
3	RX - RS-232 Receive	Input
4	SCL – SMBus Clock	I/O
5	TX – RS-232 Transmit	Output
6	NC	N/A
7	NC	N/A
8	+VSMB – SMBus Voltage	Input
9	GND – Signal Ground	N/A
10	GND – Signal Ground	N/A

*** WARNING: +VSMB (pin 8) must not exceed +5.25V. Overvoltage at this pin can permanently damage the battery control circuitry. ***

PC/104 Bus Connectors Information

PCI-104 Connector Pinout

Connector P3 is connects to the PCI-104 bus, a full listing of the pinout of the connector is found in the table below. All connected power rails are shown as well in the table below, any listed "NC" pin will be just a straight pass-through connection, with no on-board connection.

Jumper **J5** can be installed to supply either 3.3V or 5V to the VIO pins on the PCI-104 bus.

Connector Location and Pin Orientation
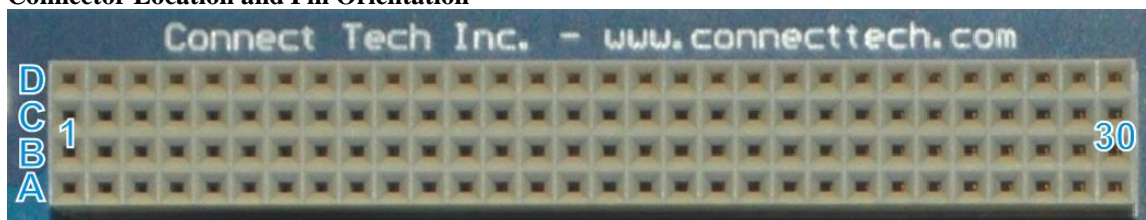
Pinout Table

Pin	A	B	C	D
1	GND	NC	+5V	NC
2	VIO*	NC	NC	+5V
3	NC	GND	NC	NC
4	NC	NC	GND	NC
5	GND	NC	NC	GND
6	NC	VIO*	NC	NC
7	NC	NC	GND	NC
8	+3.3V	NC	NC	+3.3V
9	NC	GND	NC	NC
10	GND	NC	NC	NC
11	NC	+3.3V	NC	GND
12	+3.3V	NC	GND	NC
13	NC	GND	NC	+3.3V
14	GND	NC	+3.3V	NC
15	NC	NC	NC	GND
16	NC	NC	GND	NC
17	+3.3V	NC	NC	+3.3V
18	NC	GND	NC	NC
19	NC	NC	VIO*	NC
20	GND	NC	NC	GND
21	NC	+5V	NC	NC
22	+5V	NC	GND	NC
23	NC	GND	NC	VIO*
24	GND	NC	+5V	NC
25	NC	VIO*	NC	GND
26	+5V	NC	GND	NC
27	NC	+5V	NC	GND
28	GND	NC	+5V	NC
29	+12V	NC	NC	NC
30	-12V	NC	NC	GND

VIO*	= Can be set to +3.3V or +5V via on board jumper

Remote ON/OFF Functionality

The Xtreme/PSU-UPS incorporates remote ON/OFF functionality, in order to necessitate remotely turning the Xtreme PSU ON or OFF from a mechanical switch or digital I/O.

+5V-Standby Functionality
The +5V-Standby power will continue to remain turned ON at all times whenever the input power is present, this will be independent of the SHUTDOWN# pin
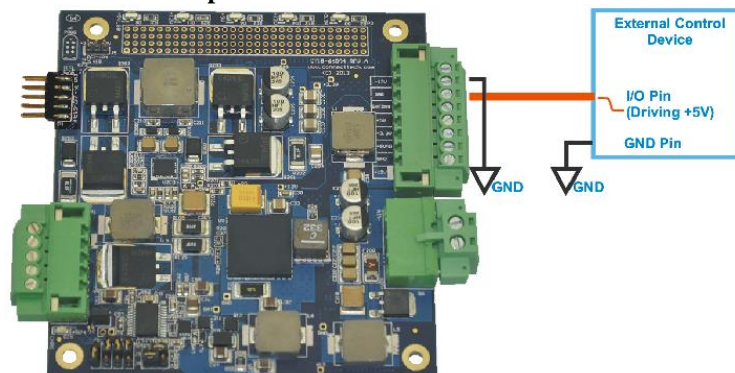
Turn Supply ON

When the SHUTDOWN# pin is left floating, unconnected or is driven externally to a voltage above +1.5V (min) and +5V (max), the Xtreme/PSU-UPS' +5V, +3.3V, -12V and +12V rails will turn ON.

Connection Example A - Mechanical Switch Method
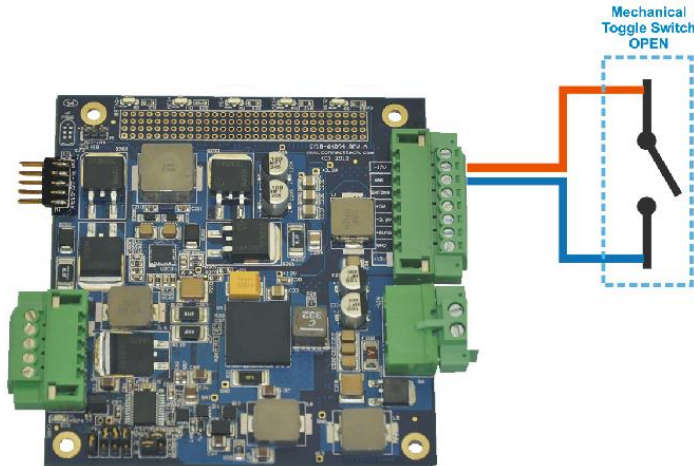
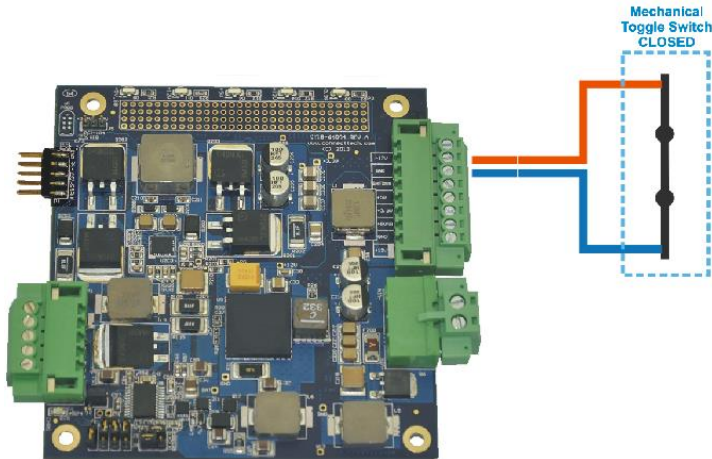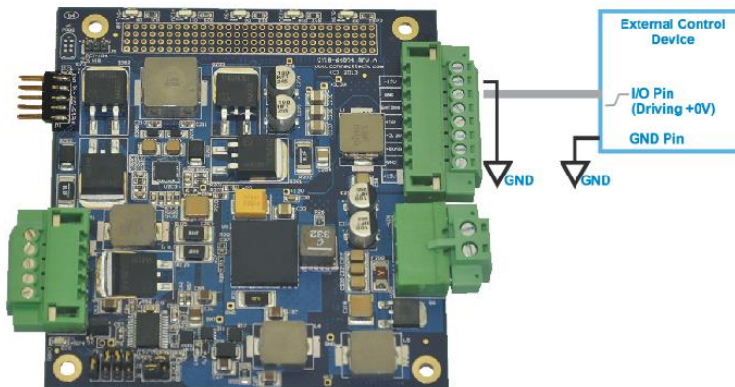**Connection Example B - External I/O Control Method**

Turn Supply OFF

Connecting the SHUTDOWN# pin to ground the Xtreme/PSU-UPS' +5V and +12V will turn OFF. Alternatively the Xtreme/PSU-UPS can be turned OFF by driving the SHUTDOWN# pin to a voltage below +1.3V.

Connection Example A - Mechanical Switch Method

Connection Example B - External I/O Control Method

Software Interface

The *Xtreme/PSU-UPS* includes multiple interfaces for monitoring of the battery status and control of the power outputs.

RS-232

The *Xtreme/PSU-UPS* includes an on-board RS-232 port for monitoring and control of the power outputs. The port runs at 57600 baud and a summary of the available commands are below.

Warning: When connecting the RS-232 signals, ensure that **ONLY TX, RX and GND** are connected to the header; RS-232 voltage levels on the accompanying SMBus signals can cause damage to the board.

Serial Command	Description
VER?	Display firmware version
HELP?	Display a list of available functions (from this table)
STARTUP=X	Startup power supply in specified number of seconds [X]
SHUTDOWN=X	Shutdown power supply in specified number of seconds [X]
BATVOLT?	Display the battery voltage
BATCURRENT?	Display the battery current (Negative values indicate current out of the battery, positive values indicate current entering the battery [charging])
BATTEMP?	Display the battery temperature in Celcius
BATCAPACITY?	Display the remaining battery capacity
BATCYCLES?	Display the battery charged cycle count

SMBus Interface

The *Xtreme/PSU-UPS* also includes direct access to the SMBus for monitoring of the battery. The SMART battery can be accessed at SMbus address 0x16. Available commands vary depending on SMART battery manufacturer; refer to the battery datasheet for additional information. General information available on all SMART batteries can be read with the following register and command codes providing the necessary data:

Function	Command Code	Access (R/W)	Data	Description
Temperature ( )	0x08	R	0.1^{o}K	Battery Temperature
Voltage ( )	0x09	R	mV	Battery's Voltage
Current ( )	0x0A	R	mA (signed int)	Battery Current supplied/accepted
RemainingCapacity ( )	0x0F	R	mAh	Predicted remaining battery capacity.
FullChargeCapacity ( )	0x10	R	mAh	Predicted Capacity at full charge.
RunTimeToEmpty ( )	0x11	R	min	Predicted time to Empty
CycleCount ( )	0x17	R	cycles	Number of charge cycles performed on the battery.

USB

The *Xtreme/PSU-UPS* includes an on-board micro USB port for monitoring of battery state, power status and other critical power management information. The interface adheres to the USB-HID Battery standard and is supported natively in Windows and using the Network UPS Driver (NUT) in Linux distributions.

Windows 8 / Windows 7 / Windows XP

Once the USB is connected to the system Windows will automatically recognize the device as an HID device and install the appropriate drivers. Once the drivers are installed you should see a new HID UPS Battery device listed under device manager.
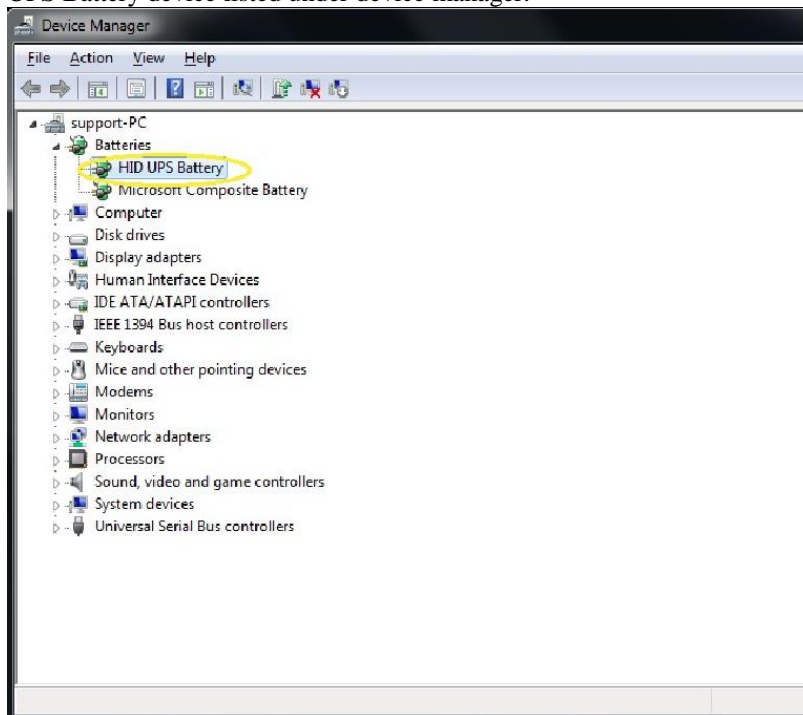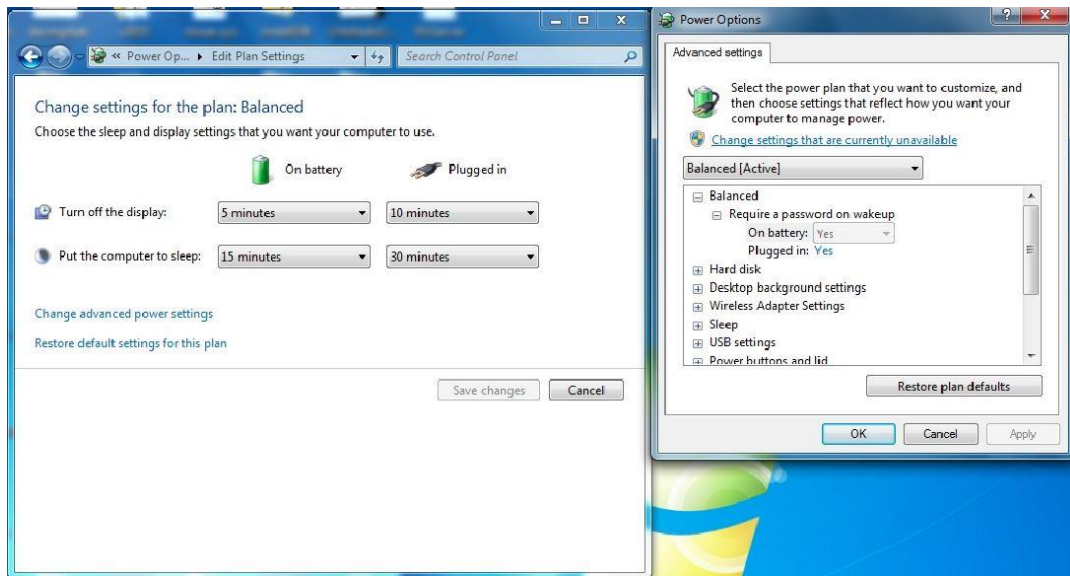

The battery icon will also appear in the taskbar.

Clicking on the battery icon will provide some more information including remaining battery life and selected power plan.
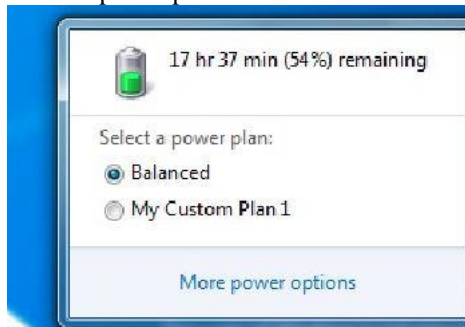
Clicking "More power options" will bring up the power options menu where you will be able to create and edit power plans according to your specific requirements.

Windows Application Integration

Microsoft provides the Windows Power Management API that can be used to manage the device in a custom software application. Any third party software that uses Windows Power Management can also be used.

For more details on software development using Windows Power Management please see the following reference http://msdn.microsoft.com/en-us/library/windows/desktop/bb968807(v=vs.85).aspx

Linux

The Xtreme/PSU-UPS can be integrated into linux systems using the Network UPS Tool driver packages, the latest release can be downloaded at http://www.networkupstools.org/download.html

In order to use the Xtreme/PSU-UPS you will need the Connect Tech patch for NUT which can be downloaded from our website at http://www.connecttech.com/ftp/Drivers/ctinutv001.tgz

Extract the NUT package and the patch file to a directory of your choice and apply the patch
#patch –p0 < ctinutv001.patch

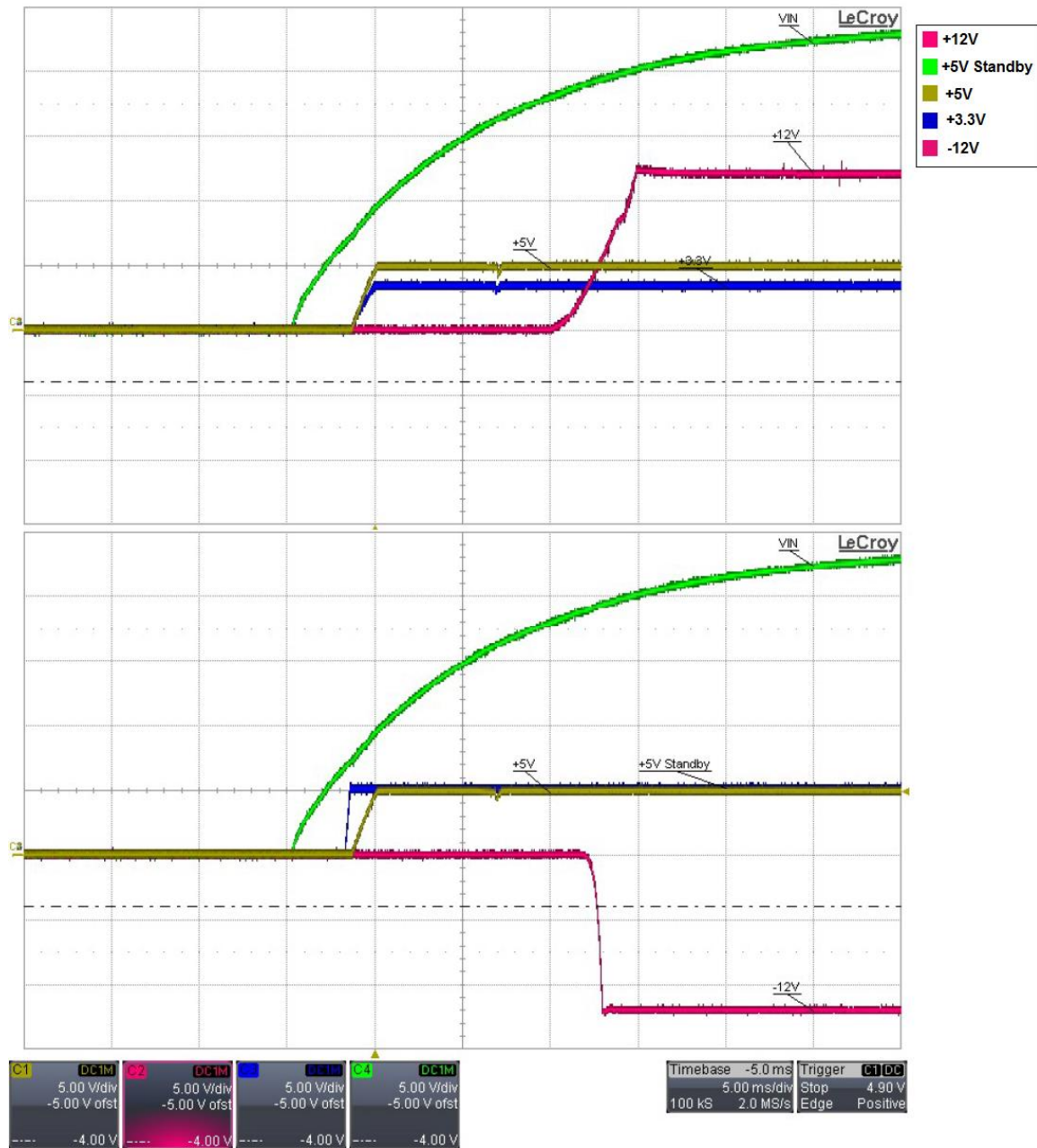Once the patch is applied you can configure and install the tools as stated in the NUT User Manual here
http://www.networkupstools.org/docs/user-manual.chunked/index.html

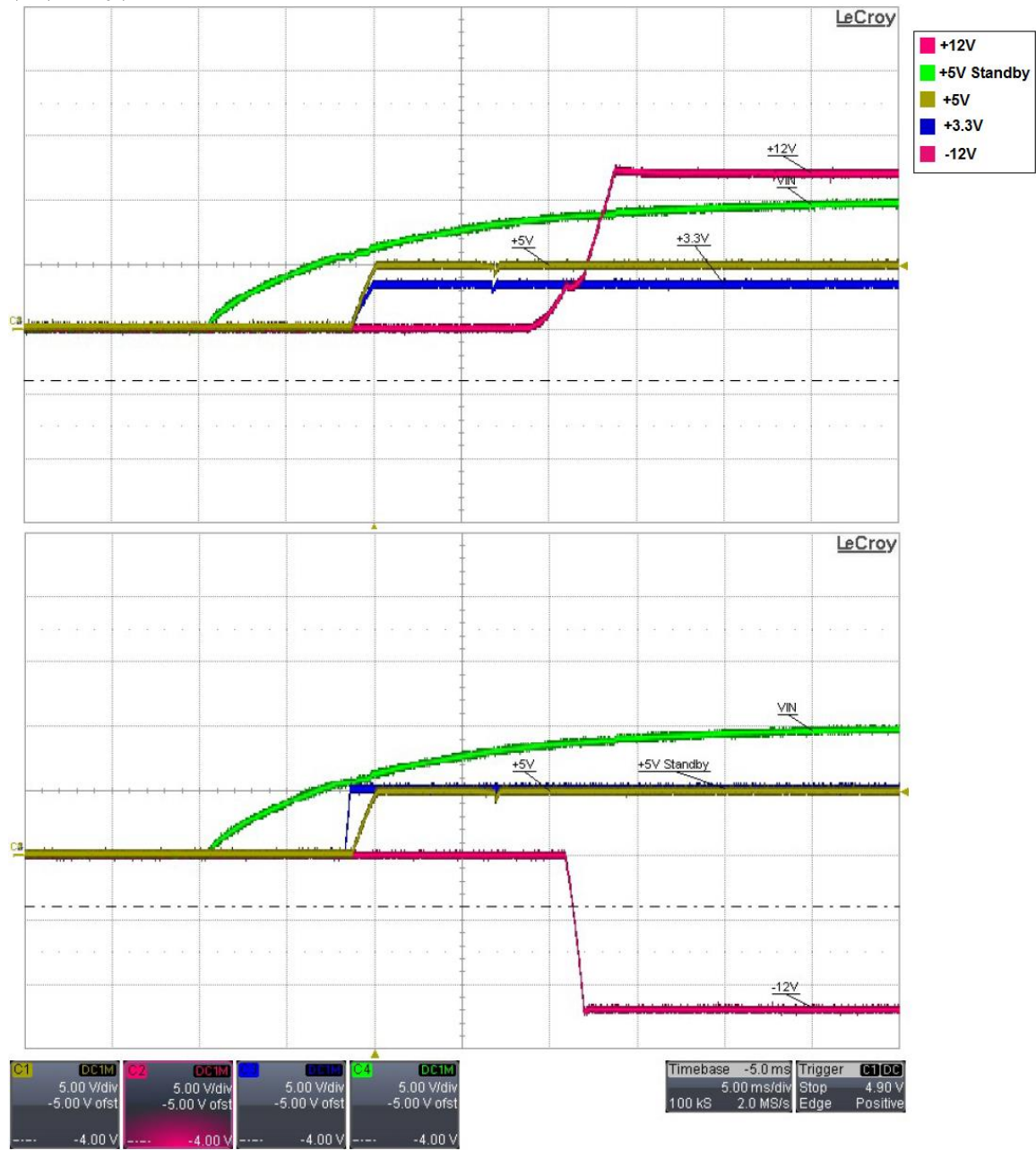***Note: You must run the configuration script with the "–with-usb" option to ensure USB drivers get built.***

Power Sequencing Details

Below are some oscilloscope captures of the Xtreme/PSU-UPS' power sequencing during initial power up. The default sequencing is of the following order: +5V-SB → +5V →+3.3V→-12V→ +12V. If your system requires a different sequence, adjusted parameters, or default startup/shutdown delay please contact support@connecttech.com and a custom board can be ordered to exactly fit your needs.
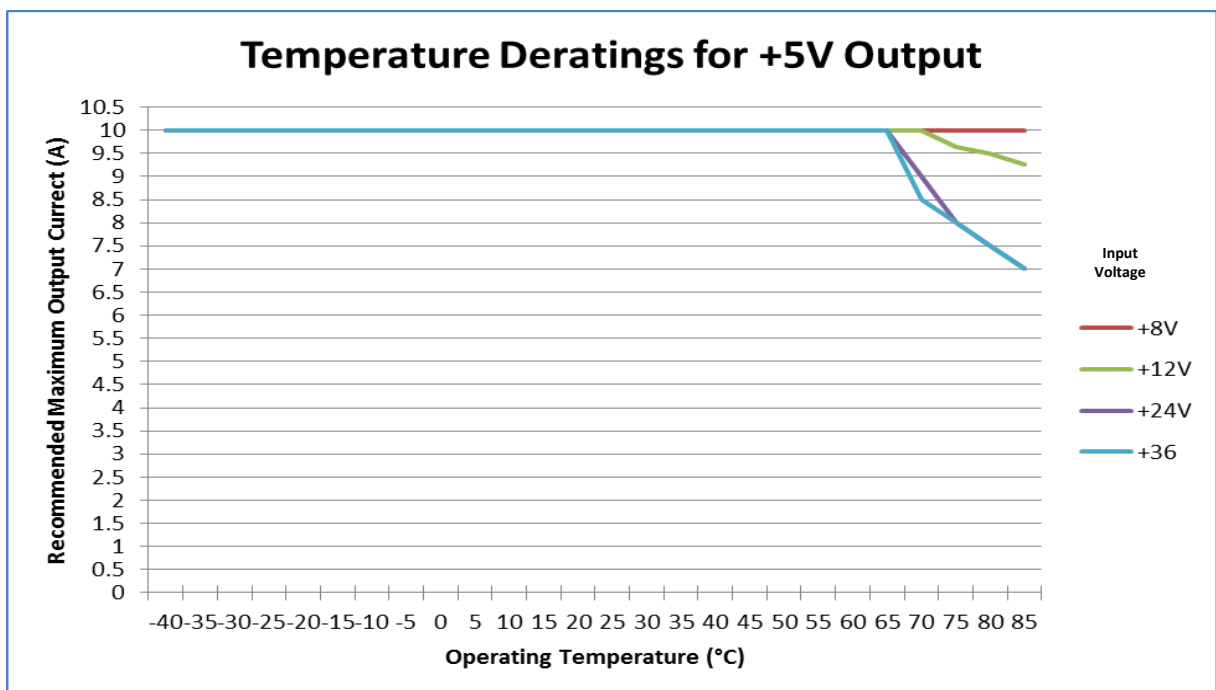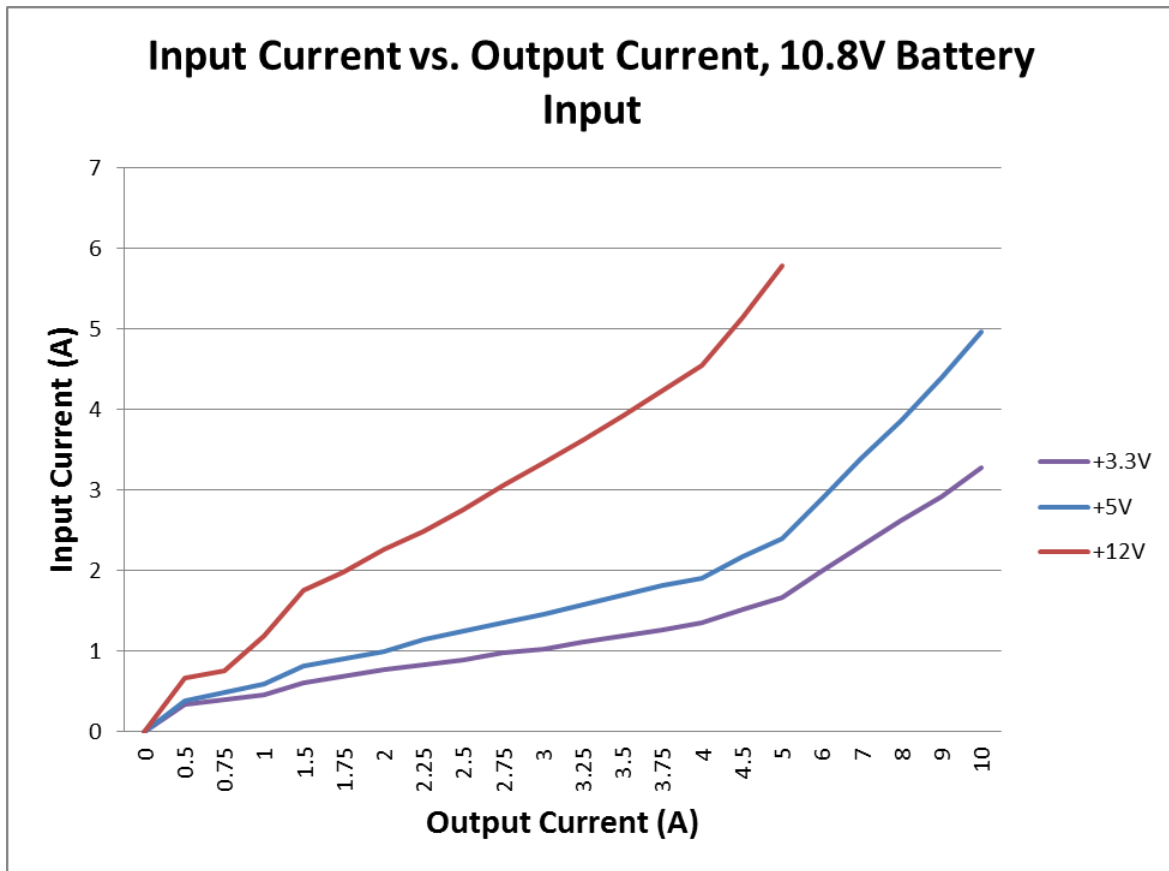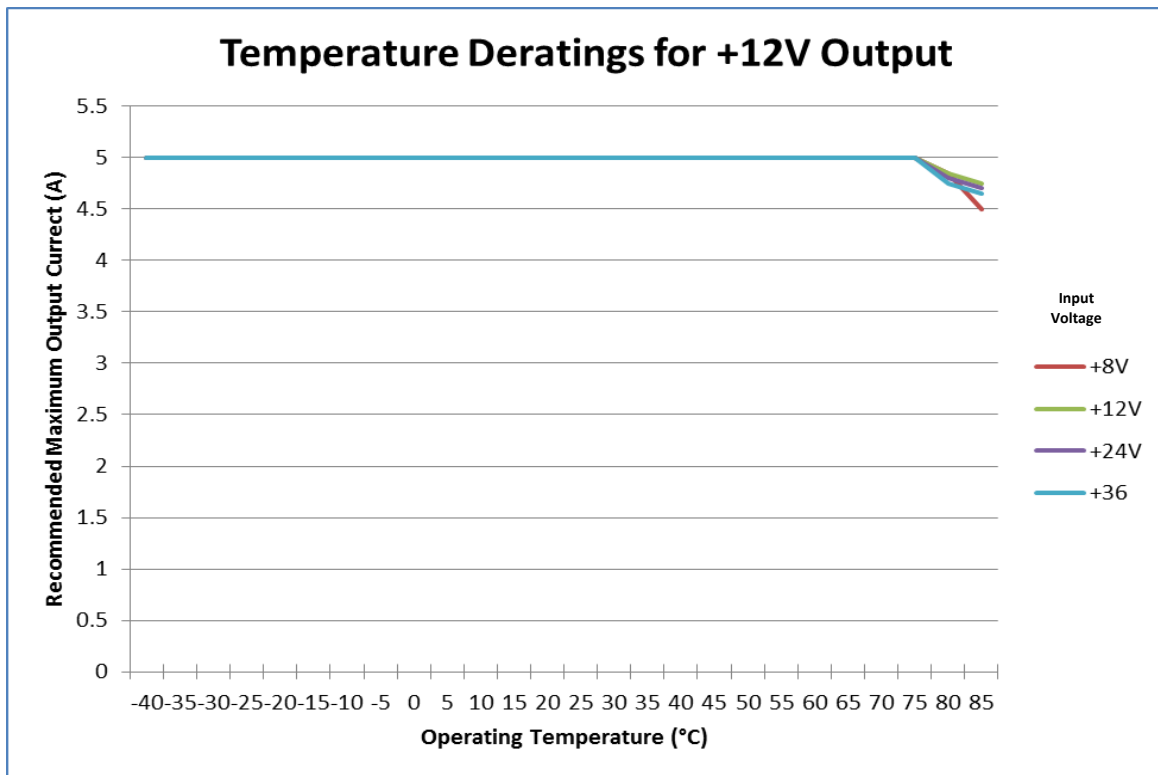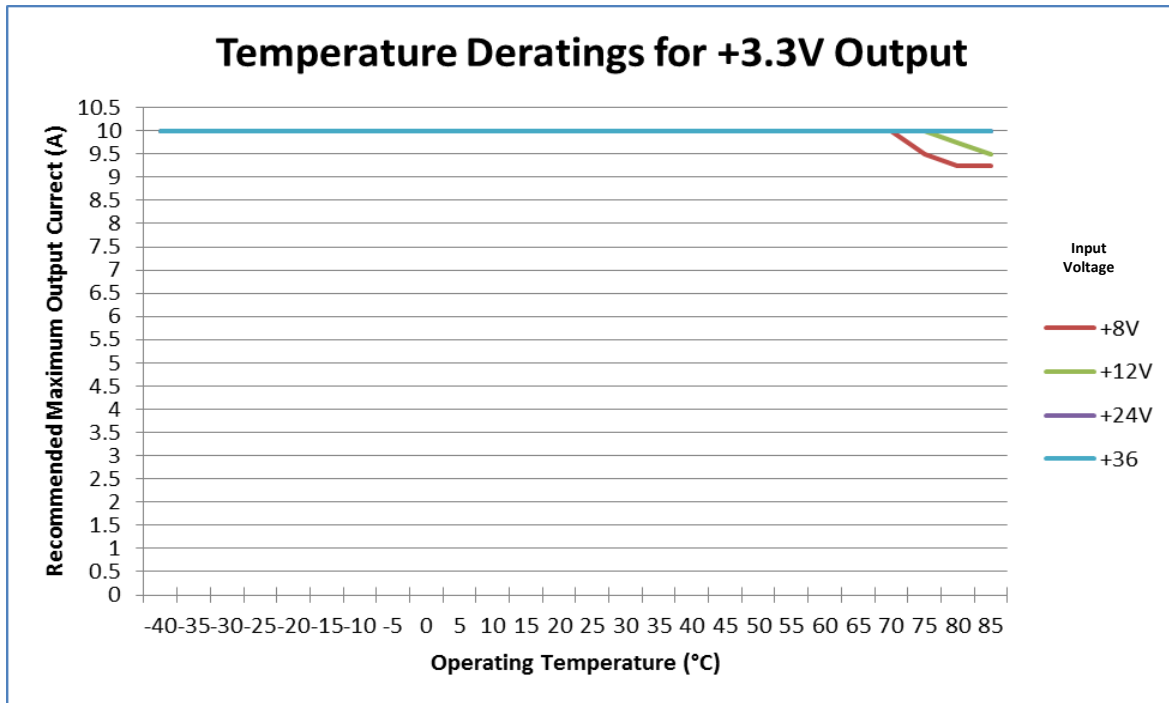
VIN = +24V

VIN = +10V

Detailed Specifications and Derating Graphs

Input Current vs. Output Current, 10.8V Battery Input

Temperature Deratings for +5V Output

Temperature Deratings for +3.3V Output

Temperature Deratings for +12V Output

*All temperature deratings based on test results in a 125CFM test chamber.